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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/685,042	10/10/2000	Shuichi Kobayashi	35.G2657	3110

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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 12/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/685,042	KOBAYASHI, SHUICHI	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,7,11,13,15,17 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,7,11,13,15,17 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *15*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 23, 2003 has been entered.

2. This Office Action is also in response to applicant's amendment filed on September 23, which has been entered as paper number 20.

3. By this amendment, the applicant has amended claims 1, 7, 11.

4. Claims 1, 4, 7, 11, 13, 15, 17 and 18 remain pending in this application.

Response to Amendment

5. The amendment filed on September 23, 2003 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: **Claims 1 and 11 have been amended** to include the feature "the first diffraction part reduces the incident angle of a light ray which is incident on said second diffraction part". The first diffractive part, which has *positive power*, that would converge the light toward the second diffractive part which will not be able to "reduce" the angle of incident.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

> pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. **Claims 1, 4, 7, 11, 13, 17 and 18 are rejected under 35 U.S.C. 112, first paragraph**, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The reasons for rejection are based on the newly added matters set forth in the paragraph above. The applicant is respectfully noted that if the first diffractive part has a positive power, the light will be converged more, which therefore will **not be able** to reduce the incident angle. For if the first diffractive part has a negative power, the light will be diverged, which **depends** on the incident angle of the light to the first diffractive optical part, the angle *may either be increased or reduced* by the diffractive action. Claims 4, 7, 13, 17 and 18 inherit the rejections.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. **Claims 1, 4, 7 and newly added claim 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Mukai et al (PN. 6,052,234) in view of the patent issued to Ishii (PN. 6,157,488).**

Mukai et al teaches a *viewfinder optical system* having an objective optical system (tg, Figure 7) in *front* of a *pupil* (he), wherein the objective lens system comprises a double concave lens (g1), which is a *negative* lens, having a *diffractive* surface (s2) and a convex lens (g2), which is a *positive* lens, having a

diffractive surface (s3), (please see Figure 7). Mukai et al teaches that the diffractive surface on the negative lens is having *negative power* and the diffractive surface on the positive lens is having *a positive power*, (please see column 6, lines 33-36), such that the first diffractive surface has a negative power and the second diffractive surface has a positive power. It is implicitly true that the second diffractive surface is *behind* the first diffractive surface since the incident light reaches the first diffractive surface first. The first diffractive surface will diverge the incident light toward the second diffractive surface as shown in Figure 7, the light incidents on the first lens at a non-zero incident angle will have its angle with respect to normal reduced by the first diffractive surface. With regard to the features concerning the "layered diffraction optical member laminated with a plurality of diffraction parts", in light of the specification and the drawings 1B, 4B and 6B, it is understood that the phrase means that two diffraction parts are formed at *different* optical elements with the combination of the two elements serves as the "layered diffraction optical *member*". With this interpretation, the objective lens system having the negative lens with the negative power diffraction surface and the positive lens with the positive power diffraction surface is considered to be the "layered diffraction optical *member*", wherein the diffraction surfaces are *laminated* on the lens elements.

This reference has met all the limitations of the claims with the exception that Mukai et al does not teach explicitly that the two diffractive optical elements are made with materials of different wavelength *dispersion property*. Ogata does teach about to design the lens system with correction of the chromatic aberration. **Ishii** in the same field of endeavor teaches a diffractive optical element having layered diffractive surfaces or parts that also has refractive power (please see Figures 22 and 23), wherein the diffractive surfaces are formed on optical materials of different dispersion properties, (please se column 13, lines 33-54) in order to achieve achromatic condition, (i.e. reduce or eliminating the chromatic aberrations in the lens system). It would then have been obvious to one skilled in the art to apply the teachings of Ishii to modify the optical system of Mukai et al for the benefit of providing a

design for the diffractive surfaces to more effectively achieve the achromatic condition and to reduce the aberrations given rise by the diffractive surfaces.

The lens system is designed to be a viewfinder that implicitly implied to be operated in the visible wavelength range. With regard to claim 4, Mukai et al teaches that an air space separation is between the two diffractive optical elements, (pleas see Figure 7). With regard to claim 7, Mukai et al teaches that the optical system further comprises other lens groups, which serve as the refractive optical devices.

With regard to claim 17, Mukai et al does not teach explicitly that the diffractive surfaces are of blaze shapes. However diffractive lens having blaze shape is very well known in the art as demonstrated by the teachings of **Ishii** (Figure 6). Ishii also teaches that the orientation of the blaze shape may be opposite to each other, (please see Figure 31). It would then have been obvious to one skilled in the art to modify the diffractive surfaces of Mukai et al in accordance with the teachings of Ishii for the benefit of providing the diffractive surfaces with high diffraction efficiency.

9. Claims 11, 13, 15 and newly added claim 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Ushida et al in view of the patent issued to Ishii (PN. 6,157,488).

Ushida et al teaches a *projection optical system* that is comprised of a *layered diffraction optical system* laminated with *diffraction optical elements* (G_1 and G_2) wherein the layered diffraction optical system is placed *behind* an *aperture stop element* (element 25 in Table 2) or *iris*, that serves as the *pupil*, of the projection optical system. Ushida et al teaches that the first diffraction optical element has a *positive* power and the second diffractive optical element has *negative* power, (please see column 6, Figures 1-2). Ushida et al teaches that the first diffractive optical element is made of glass material such as *quartz* and the second diffractive optical element is made of glass material such as *fluorite* wherein quartz and fluorite have *different wavelength dispersion property*, (please see column 6, lines 24-29). It is

implicitly true that the diffractive optical elements have high diffraction efficiency in the intended wavelength range. It is implicitly true that the first diffractive optical element converges the incident light toward the second diffractive optical element.

With regard to the features that the projection lens has high diffraction efficiency for diffracting light in the *visible* wavelength range, this reference does *not* teach explicitly about the wavelength range intended for operation. However projection system such as *image projection system* or even exposure projection system using visible light is **very** well known in the art such feature is therefore either inherently met by the disclosure or an obvious modification to one skilled in the art for the benefit of allowing the projection system to be operable in the visible wavelength range. Furthermore, **Ishii** in the same field of endeavor teaches a diffractive optical element with layered diffractive elements wherein the diffractive element is being designed to have high diffraction efficiency in the visible wavelength range, (please see Figure 11). It would then have been obvious to one skilled in the art to apply the teachings of Ishii to modify the diffractive elements of Ushida, if this is not already the case, to make it have high diffraction efficiency in the visible range.

With regard to claim 13, this reference however does not teach explicitly that the diffractive optical elements are laminated with an air layer interposed. But such modification is either implicitly included since the diffraction optical elements have stair case profile as shown in Figures 2 and 3 which makes them necessary to have air space between the two elements or an obvious modification to one skilled in the art to achieve desired diffraction/refraction property, by interposing an refractive air medium. With regard to claim 15, the projection optical system comprises other lenses that serve as refractive optical device, (pleas see Figure 2).

With respect to newly added claim 18, Ushida et al teaches that the diffraction optical elements has stair case configuration that are of blaze shapes, (please see Figures 3 and 4). This reference however does not teach explicitly that the orientations of the diffractive optical elements are opposite to each other.

Ishii in the same field of endeavor teaches that the orientation of the blaze shape may be opposite to each other, (please see Figure 31). It would then have been obvious to one skilled in the art to modify the diffractive surfaces of Mukai et al in accordance with the teachings of Ishii for the benefit of providing the diffractive surfaces with high diffraction efficiency.

Response to Arguments

10. Applicant's arguments with respect to claims 1, 4, 7, and 17 have been considered but are moot in view of the new ground(s) of rejection.

11. In response to applicant's arguments, which state that, the cited Ushida et al reference discloses a photolithographic projection system and make reference to "deep ultra violet region" but not visible wavelength range, the examiner respectfully disagrees for the reasons stated below. Firstly the examiner wishes to point out respectfully that Ushida et al reference discloses a *projection optical system* wherein NO SPECIFIC range of wavelength for operation is ever given. Applicant is respectfully reminded that although the Japanese patent 4-214516 is mentioned in the cited Ushida reference, no reference of any kind to US patent 5,170,207 is given. Even if the US patent is considered a reference to the cited Ushida reference, the lens systems in the both references cannot be identical since the US patent (5,170,207) only has **one** Fresnel lens while the Ushida reference teaches **two** diffractive optical elements. Also none of the references teaches specifically of "preventing" the projection lens being used in visible wavelength ranges. It is known in the art that visible light wavelength is considered to be higher harmonics of ultraviolet wavelength. In theory, there cannot be prevention of the projection lens from used in either of the wavelength regions only. Furthermore, the reference to deep ultra violet region is only mentioned as a *general property* of a binary optics (BOE), (please see column 4, lines 7-14), but no where in the reference ever mentioned that the optical projection system is operable in the deep ultra violet wavelength region and such limitation cannot be applied here. A binary optics as well known in the art can be

designed to diffract light in visible wavelength range, (please see the patent issued to Neal et al (PN. 5,864,381)). It is the fundamental theory of diffraction that diffraction property is determined by the phase modulation of the diffractive optical element upon the incident light wherein the phase modulation depends on the wavelength of the incident light. It is therefore an obvious modification to one skilled in the art to design the diffractive optical element that is capable of diffracting light in the visible wavelength region.

Furthermore, optical projection system is widely applied in the art as for *image projection system* or *lithographic system*, wherein each of the systems can be operated by light in the visible wavelength range. The applicant is respectfully reminded that the dependence of diffraction efficiency of the angle of incident is true for light of any wavelength is not only for DUV light.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 703-305-6208. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 703-305-0024. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Audrey Y. Chang
Primary Examiner
Art Unit 2872

A. Chang, Ph.D.